ENGINEERING NEWS-RECORD

Green Mountain Dam Ready for Fill—*See page 4*

AUG 10 1940

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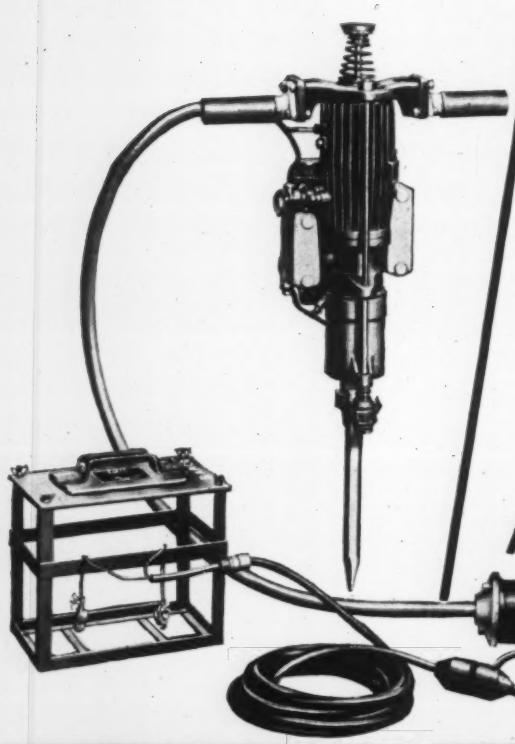

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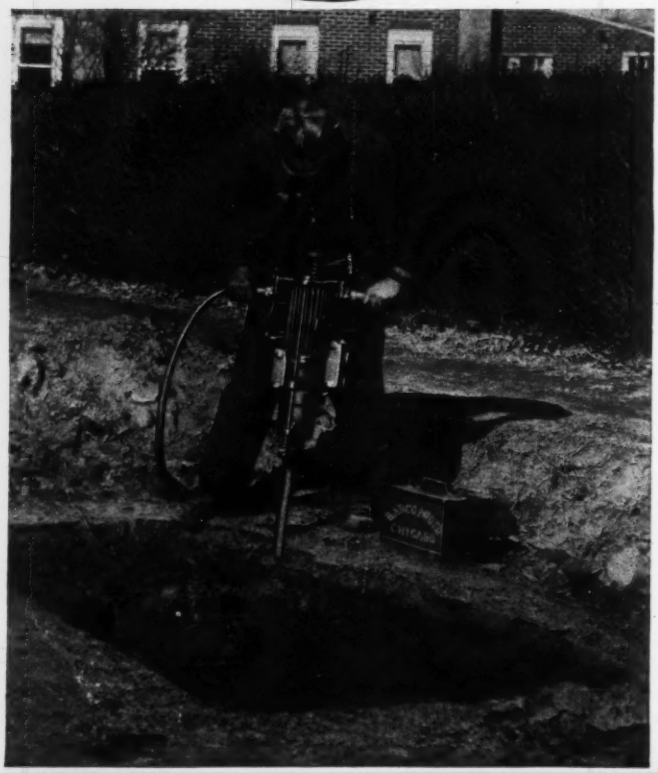

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The Week In Engineering and Construction

ENGINEERING NEWS-RECORD • AUGUST 8, 1940

Warehouses and factories in five billion dollar bill

Most of $200,000,000 for construction is for this type of work. The bill includes $82,000,000 for army posts

The five billion dollar military appropriation bill passed the House last week in almost exactly the amounts requested by the President (*ENR*, July 18, p. 38). Of the more than two hundred million dollars which will go for construction out of this money, nearly all is either for factories to turn out military supplies or for warehousing facilities to store the greatly increased stocks of material contemplated in the bill.

Additions to army post

Biggest single item is $82,000,000 allocated to construction at army posts. Of this, $32,000,000 will be used for ammunition magazines. These are igloo-type conical concrete structures partially underground, covered with several feet of dirt, and spaced at intervals of several hundred feet. Locations and numbers have not yet been determined, but most of them will be located at four large depots to be placed in the interior of the country away from centers of population. Work on these is not expected to get started before next year.

For storage of aircraft parts and spare engines, $13,787,000 will be spent on single-story temporary buildings of steel and sheet metal. Most of this will probably be at Dayton. Airplanes themselves are ordinarily parked out of doors, so no hangars are contemplated.

Most of the rest of the $82,000,000 will go for general supply depots and to garage about 57,000 vehicles. This last will range from temporary sheds costing about $190 per car to permanent steel and concrete warehouses costing, with utilities, about $4 per sq. ft.

Includes $37,750,000 naval work

For public works of the Navy's Bureau of Yards and Docks, the bill appropriates $37,750,000, scattered around a great many naval bases. Although some of this is for operating facilities, most is for fuel and ammunition storage and for additional facilities at navy shipyards and gun factories. The $7,000,000 originally scheduled to be included for the Navy's share of a $14,000,000 drydock to be built in cooperation with the Port of New York Authority was eliminated because it is being considered in a separate bill.

Some construction is included in an item of $36,000,000 for additional seacoast defenses.

A sum of $325,000,000 is appropriated for expediting production of military needs. This means construction of government-owned factories to fill holes in commercial production facilities. Of this sum $15,500,000 is for dredging and dock improvements at existing depots and another $11,225,000, mostly construction, is for rehabilitation and replacement of arsenal and warehouse buildings. Of about $70,000,000 for shell-loading plants, a large proportion will go for buildings and utilities. Of $210,000,000 for other

Bureau of Reclamation Photo

Concrete placing begins for fourth largest masonry dam

Harvey Slocum (left), general superintendent for the general contractors on Friant Dam (Griffith Co. and Bent Co.) and R. B. Williams,, construction engineer at Friant for the Bureau of Reclamation, shake hands in front of the first bucket of concrete going into place in the dam, July 29. A total of 2,200,000 cu. yd. of concrete will be required for the dam, which will be exceeded in size by only Boulder, Grand Coulee and Shasta dams.

Friant Dam, being built on the San Joaquin River, in California, will provide irrigation water for five California counties. It will be of concrete gravity type, straight in plan, 3,340 ft. long and 325 ft. high. The 520,000-acre-ft. reservoir to be created will supply 70,000 acre-ft. for flood control and 350,000 acre-ft. for irrigation. Total cost of construction is estimated as over $16,000,000. The dam is part of the Central Valley project.

types of plant, something over $40,000,000 will be for construction. Most of the cost of an $8,500,000 proving ground will be construction. In all, something like $100,000,000 of the funds for expediting production will be spent on construction.

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Civil engineers to leave Am. Engineering Council

The American Society of Civil Engineers is to withdraw from American Engineering Council at the end of this year. Action to that end was taken at the recent meeting in Denver when the board of direction voted to give the council formal notice of the pending withdrawal of the society. Constituent societies are required to give 90-day notice of such a change.

Withdrawal from the council has been under consideration by the Am. Soc. C. E. for some time due to widespread dissatisfaction with the accomplishments of council and the belief that the very considerable annual cost to the society could be spent to better advantage elsewhere.

American Engineering Council was formed in 1920 by seven national and fourteen state or local societies. The civil engineers were the only one of the Founder Societies that did not join at that time. They did not come in until 1929, when the council amended its constitution to give member societies power to take action on national matters at variance with that of the council. The council now is made up of eight national organizations and 45 state and local societies.

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Lent named secretary of Engineering Council

L. B. Lent, a consultant in the aviation field, has been appointed executive secretary of the American Engineering Council, effective immediately. He succeeds Frederick M. Feiker, who resigned several months ago to become dean of engineering at George Washington University.

Lent, who graduated from Stevens Institute of Technology, Hoboken, N. J., was for a time with the Riverside Engine Co., Oil City, Pa., was an associate editor of *Power* for five years and served as assistant chief engineer of construction and maintenance with the Ford Motor Co. Following work as superintendent of the U. S. Air Mail Service, he was made chief engineer of the Common Brick Manufacturers' Association of America. Recently, as consultant in the aviation field, he has been employed by the Aeronautical Development Commission of the State of Connecticut.

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Labor dispute renewed in Washington

Washington's troubled building labor situation flared up again in two spots last week. Union plasterers on the federal office building intended for the defense commission defied the orders of their international union and the AFL building trades department by renewing a jurisdictional strike against the carpenters over the placing of acoustical tile and temporary sawhorses. Under the AFL-AGC agreement of last year the strike, which had held up construction of the urgently-needed building for several days last month (*ENR*, Aug. 1, 1940, p. 142), had been terminated pending adjudication of the dispute. Building trades officials are now trying to get the work going again.

Meanwhile, much other construction in the District of Columbia was held up by efforts of a recently-organized AFL local to organize Washington brickyards. Brickworkers' picket lines were thrown around construction jobs using brick from yards refusing to sign up with the union, preventing union building tradesmen from going to work. The brickworkers, however, followed a policy of not picketing buildings involved in the defense program.

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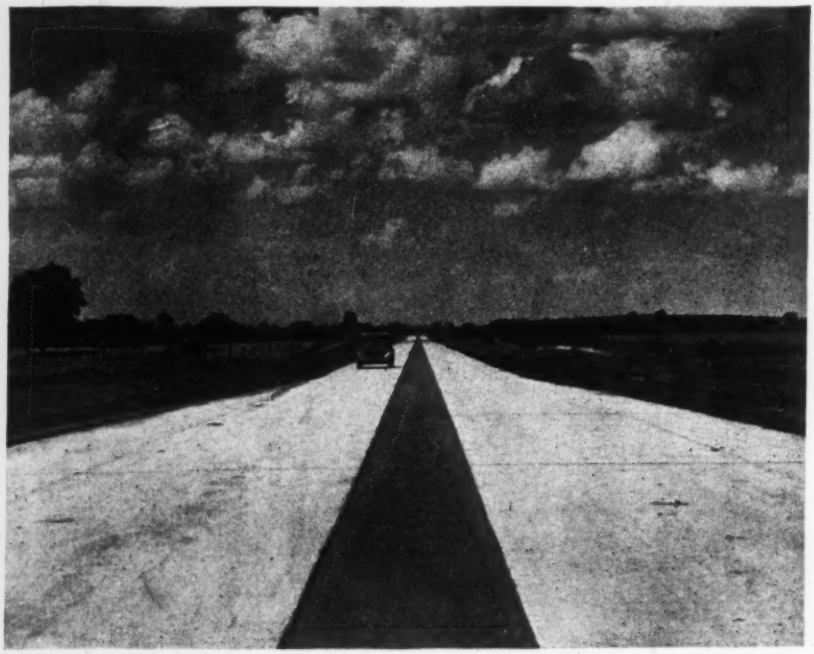
Design change increases cost of Stevens Dam

Cost of Stevens Dam (formerly Mud Mountain Dam) on the White River near Seattle, Wash., will be increased greatly, perhaps by more than $1,000,000, as a result of changes in design of the flood-control structure by the U. S. Engineers. Because it has been found that the earth available for the fill work is not suitable for the surface of the dam due to excessive clay content, the original plan calling for an earthfill dam has been changed to provide for a rock faced structure.

Cost of the change has not been entirely worked out, but a supplemental contract has been made with the Guy F. Atkinson Co., San Francisco, contractor for the dam, providing that the face of the dam will be put in at a cost plus basis. The added expense will be roughly the difference between 44 cents and $1 a yard for about $1,500,000 cu.yd. of basaltic rock required by the change. The original contract price was $5,344,605.



Illinois seeks highway safety

Providing one lane of traffic in each direction, a new belt highway has been placed in service at Springfield, Ill., which has two slabs separated by a 3-ft. center strip of bituminous material on a concrete base. The strip not only clearly marks the division between traffic lanes but also encourages drivers to keep on their own side of the road. If the present highway is widened to four lanes, the central bituminous strip can be left as it now is or replaced by a center raised curb in general use on duel lane highways.

The Illinois State Division of Highways did the work.

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Cherokee Dam started by the TVA

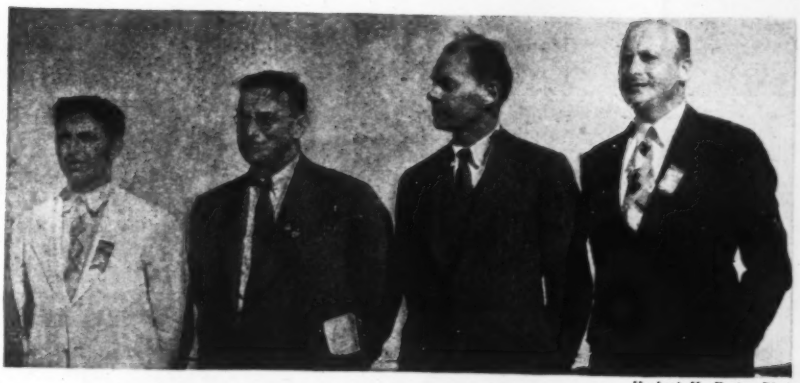
Authority to rush $65,000,000 project to provide power for defense work

Preliminary work on TVA's new Cherokee Dam on the Holston River, 33 miles from Knoxville, Tenn., was started last week a few minutes after word was flashed by telephone that President Roosevelt had signed a measure appropriating $25,000,000 to start a $65,000,000 project for additional power in the valley. The dam, to cost $36,000,000 and provide 90,000 kw, will be supplemented by a 120,000-kw steam plant costing $10,500,000. A $14,000,000 transmission system and $5,000,000 for additional generators (88,000 kw) at Wilson and Pickwick dams downstream complete the project. The latter will take advantage of the improved regulation of the river provided by Cherokee Dam.

The dam will be a concrete gravity and earth structure 6,600 ft. long including 700-ft. dikes. At the 424-ft. long spillway section it will be 173 ft. high. It will contain about 700,000 cu.yd. of concrete and 3,000,000 cu.yd. of earth.

Construction of the dam will be something of a race against time. The Aluminum Co. is installing additional capacity at its Tennessee Valley plant, urgently needed for the aircraft program, and will be demanding power in 1942. It is intended that the dam be closed in January, 1942, to start storing winter rains. By April, the dam proper should be complete, with a full reservoir, and releasing water to the downstream generators. The three 30,000-kw. generators at the dam are to be installed in August, September, and October. If this schedule is not met and the winter and spring floods are lost, the entire program may be held up a year.

The steam plant is scheduled to start operating in December, 1941.



Herbert H. Foster Photo

Their job dedicated Aug. 3

Present at the dedication ceremonies Aug. 3 for the Jamestown (R. I.) Bridge were, left to right: William H. Bruce, resident engineer for the consultants—Parsons, Klapp, Brinckerhoff & Douglas, New York; Frank Barnes, construction manager for the contractors—Merritt-Chapman & Scott, New York; E. L. MacDonald, chief engineer for the consulting engineers; and Thomas Harris, secretary of the Harris Structural Steel Co., New York, which did the superstructure work. Not shown are: Wm. Denny, construction superintendent for Merritt-Chapman & Scott, and Tom Iverson, resident engineer for the PWA.

Replacing a ferry system providing some form of transportation since 1675, the Jamestown toll highway bridge spans the western passage of Narragansett Bay.

Construction will be under the direction of Theodore B. Parker, chief engineer of the TVA, and work at the dam will be directed by Lee G. Warren, who has been at Watts Bar Dam.

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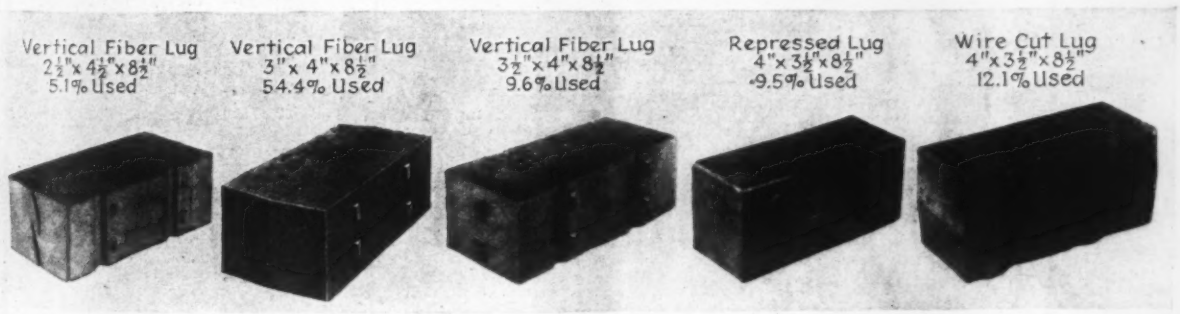
Presidential ban eased on reclamation projects

Protests from the irrigation states have led the President to indicate that his opposition to new reclamation projects during the defense emergency is not adamant. Last June, in a letter to Secretary Ickes about the Kings River project in California, the President said that the "present international situation requires the postponement" of reclamation projects (*ENR* Feb. 22, 1940, p-285). Last week, he authorized the Reclamation Bureau to spend $400,000 in preliminary work on another new project, the Anderson Ranch reservoir in Idaho, which had been held up in accordance with this policy.

A $750,000 appropriation was put through in 1938 for the $13,000,000 project which will be located on the South Fork of the Boise River. The Reclamation Bureau plans now to design the dam, clear the reservoir site, and do exploratory drilling so that it will be in a position next year to ask Congress for a construction appropriation. The President made clear, however, that he is not committing himself to approve such a request.



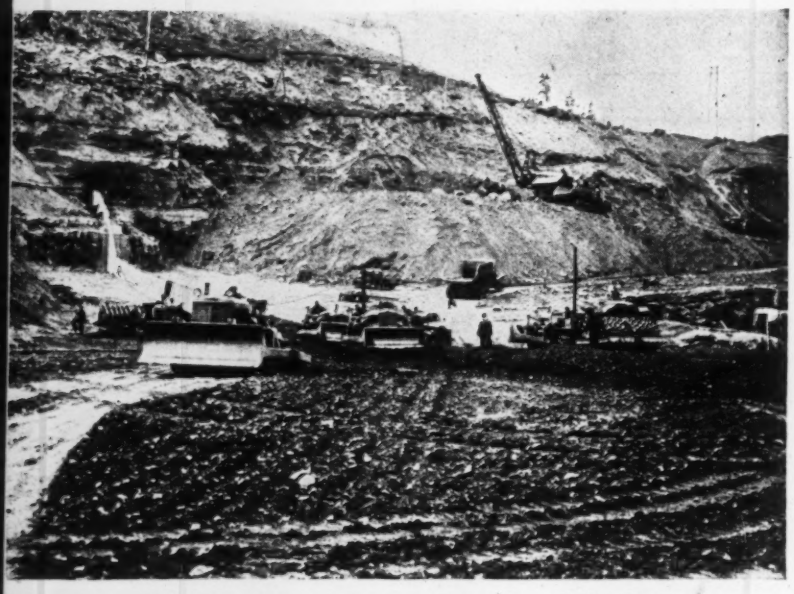
Five varieties of paving brick now recognized by simplification committee

At a meeting in Washington, D. C., recently, the Permanent Committee on Simplification of Varieties of Vitrified Paving Brick for the 19th annual review of simplified recommendation, increased the list of recognized varieties from four to five, the 4x3½x8½-in. wire cut lug brick being added to the list. The five varieties, shown above with various dimensions, are said to meet 90.7 per cent of the total normal demand for vitrified paving brick. Listed are figures as to how consumption is divided among the different varieties.

In discussing the advisability of eliminating the 2½x4½x8½-in. vertical fibre lug brick, which decreased in shipments from 15.2 per cent in 1938 to 5.1 per cent in 1939, it was decided that this variety should be included until next year for possible elimination then.

Green Mountain Da

A 285-FT. earth and rock embankment will halt flow of the Blue River in Colorado at this point. This view is looking upstream with the upper cofferdam fill under construction in the middle background. Site for the downstream toe is the near foreground.



FLEETS of rollers, scarifiers and bulldozers work the fill to maximum density in the upper cofferdam.

AIR-HAMMER TAMPING is required where the rollers are unable to work close to the shale abutments.

Da ady for fill

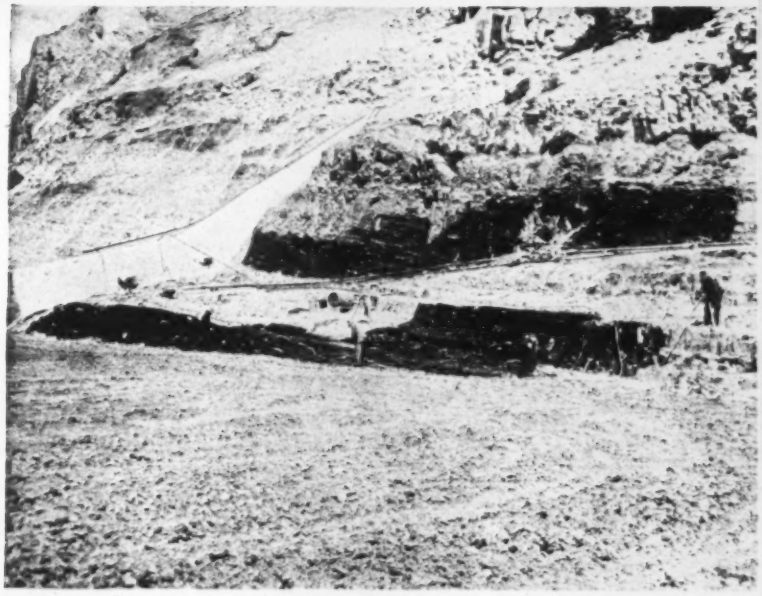
GREEN MOUNTAIN DAM on the Blue River above Kremmling, Colo., which will share honors with Stevens Dam under construction in Washington as one of the highest earthfill dams in the world, is ready for placing of earth and rockfill and riprap. To be 285 ft. high, the dam will form a replacement reservoir to compensate Western Slope water users for water diverted under the Continental Divide to the East Slope by the $44,000,000 Colorado-Big Thompson project for irrigation of 615,000 acres. The dam is being built by the Warner Construction Co., Chicago, for the Bureau of Reclamation.

The reservoir formed by the dam will flood 2,100 acres of land and will have a capacity of 152,000 acre-ft. The irrigation outlet capacity will be 1,000 sec.-ft. and the power outlet capacity 1,500 sec.-ft. Capacity of the spillway will be 25,000 sec.-ft.

Warner has started placing of the upstream cofferdam, which will form the upstream toe of the dam, with twenty 24-yd. trucks. Four big scrapers will augment this fleet in placing fill for the main dam. Installation of rock handling and material processing equipment in preparation for placing the main fill has also started; concrete cutoff walls through the foundation are about complete. During construction of the dam, river flow will be diverted through a tunnel completed this spring.

Because opening up of borrow pits has revealed a greater proportion of rock to impervious fill than was estimated earlier, the design of the embankment has been changed slightly to use more rock. The dam will contain 1,122,000 cu.yd. of impervious rolled fill and 1,739,000 cu.yd. of rock fill and riprap.

For the Bureau of Reclamation Porter Preston is in charge of the entire project and W. A. Ward is construction engineer. For the Warner company, Jas. Tripp is consultant; R. E. Ostland, job manager, and Gus Eix, superintendent. T. L. Warner, president of the contracting firm, also keeps a close eye on his company's $4,226,000 job.



TO PREVENT air slaking of the shale abutment material at Green Mountain Dam it is being sprayed with a bituminous solution. A concrete cutoff nearly complete may be seen at left.

EARTH AND ROCK fills are nothing new to these 24-yd. dump trucks, for they are part of a fleet of twenty that came from San Gabriel No. 1 in California. They have been rebuilt and fitted with diesel engines.

EXCAVATION for the powerhouse at Green Mountain is well under way at the discharge end of the diversion tunnel, which later will become the penstock.

WASHINGTON HIGHLIGHTS

ABOUT a third of the engineering and architectural work on the Navy's current public works program will be done by outside consultants, Admiral Moreel, head of the Bureau of Yards and Docks, told a congressional committee. The work is awarded on a fixed fee basis.

DEFENSE COMMISSION specialists are of opinion that the threatened shortage of steam turbine equipment (*ENR*, July 25, 1940, p. 126) will not effect the hydro turbine situation. In fact, the relative absence of congestion in the waterwheel market was urged before Congress by Consultant Gano Dunn as an argument for installation of water rather than steam power in the Tennessee Valley.

DISTANCES from Grand Coulee Dam to the Pacific Ocean given in this column recently (July 11, p. 59) were in error. The airline distance from the dam to the nearest point on the coast is 240 miles, the protected waters of Puget Sound are about 150 miles away, and Spokane is 300 miles from the coast. The three generators for the Grand Coulee power plant now on order are 150,000 hp each, not 85,000 hp, as stated in that news item.

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Continuity of Kahn firm assured by new set-up

As announced in these pages July 18, old employees of Albert Kahn, Inc., well-known firm of architects and engineers in Detroit, have been made stockholders and the firm name changed to Albert Kahn Associated Architects and Engineers, Inc. The details of how this professional firm is to be kept from the disintegration that has been the lot of many similar organizations when the men who built them die or retire seemed important enough to ask Albert Kahn to outline them.

Kahn points out that a new corporation has been organized in which about 25 key men, who have been with the organization from 15 to 35 years, will be stockholders. The corporate structure will consist of 10,000 shares of A-stock held by Albert and Louis Kahn, who provide the paid-in capital, and 2500 shares of B stock which will be given the employee stockholders. The B stockholders are to receive a dividend of not less than $8 per share before any dividend is paid the A stockholders. The novel part of the plan is that the capital is to remain for the use of the B stockholders for a period of eight years after the retirement or death of the A stockholders, a provision made to insure that the firm will not disintegrate because of lack of capital. The B stockholders will, during this time, pay back the invested capital from earnings, after which they will own all but a very small portion of the stock.

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Mike Carrozzo, union boss, dies in Chicago

Mike Carrozzo, powerful boss of construction labor unions in Chicago, died Aug. 4. He was president of the International Union of Pavers and Road Builders, and held a prominent place in the district council of the International Hod Carriers, Building and Common Laborers Union. Through these connections he ruled 23 affiliated unions in the Chicago area.

Carrozzo had successfully kept ready-mixed and transit mix concrete out of Chicago until just recently, when bids were called on transit mix for street paving. The ready-mix concrete ban is now under investigation in connection with U. S. Deputy Attorney General Thurman Arnold's probe of the building and construction industries. The federal government also claimed Carrozzo evaded income tax payments on his alleged huge income for the past several years.

JOBS OF THE WEEK

COMPLETING MARSHALL FORD DAM, Austin, Texas.

Brown & Root, Inc., and McKenzie Construction Co., Austin, were awarded a $3,137,495 contract for raising the concrete section of the Marshall Ford flood-control dam on the Colorado River in Texas. Work includes placing 464,000 cu.yd. concrete, requiring 1,332,000 lb. reinforcing steel. Cage Bros., Bishop, Tex., and W. W. Vann & Co., Kerville, Tex., got the contract for the earthwork with a bid of $903,102, contracts being awarded July 31 by Bureau Reclamation, Austin, Tex. Brown & Root and McKenzie Construction Co. built the low dam at Marshall Ford for the Lower Colorado River Authority.

AIRFIELD IMPROVEMENTS, Denver, Colo.

F. J. Kirchhof Construction Co., Denver, will construct the photographic and armament schools for the Construction Quartermaster, Lowry Field, under provisions of a $676,480 contract.

HANGARS, MacDill Field, Tampa, Fla.

Central Contracting Co., Atlanta, Ga., was the low bidder for the air corps base and flight hangars at MacDill Field with a bid of $1,003,900. Estimated cost of the work, which is being done for the Constructing Quartermaster, War Department, Washton, D. C., was $1,200,000.

BARRACKS, Norfolk, Va.

Virginia Engineering Co., Norfolk, Va., was awarded a contract by the Bureau of Yards & Docks, U. S. Navy, Washington, D. C., to construct the barracks at the Norfolk naval base. The work will be done on a cost-plus-fee basis and is estimated to cost $800,000.

DEFENSE HOUSING PROJECT, Montgomery, Ala.

Algernon Blair, Montgomery, Ala., was awarded the contract for constructing 85 brick buildings near Maxwell Field by the Montgomery Housing Authority, for which Charles P. Rogers is executive director and Moreland G. Smith, Montgomery, is architect. This work, costing $1,113,000, is the second defense housing project awarded. A smaller project at Corry Field, Pensacola, Fla., was awarded to Dyson & Co., Pensacola, at $497,000 as reported Aug. 1 in *ENR*. Funds for these projects were authorized by USHA June 14 with work expected to get under way in August and to be completed by Dec. 1.

GAS HOLDER, Indianapolis, Ind.

Bartlett-Hayward, Inc., Baltimore, Md., was awarded a $700,000 contract for a gas holder on Northwestern Ave., by the board directors of the Citizens Gas & Coke Utility, Indianapolis.

PLANT ADDITION, Harrisburg, Pa.

Harrisburg Steel Corp., Harrisburg, Pa., will, with its own forces, construct a plant to increase the firm's ability to manufacture aerial bomb forgings. Ford Bacon & Davis, New York, N. Y., will supervise the work, which is estimated to cost $500,000.

DEPOT SUPPLY BUILDING and ENGINE SHOP, Mobile, Ala.

Foster-Creighton Co., Inc., Nashville, Tenn., was awarded a $1,433,400 contract for constructing a depot supply building and an engine repair shop at Southeast Air Depot. Constructing Quartermaster, Southeast Air Depot, is the owner.

NOTE—Additional bidding and contract news on over 600 projects, large and small, appears in the Construction News Section beginning on page 13.

Welding specifications near completion

Revisions will effect design, materials, weld form, stresses, and procedure

Revision of the American Welding Society's specifications for welding of bridges, first issued in 1936, is nearing completion. A conference committee comprising representatives of the AREA and the AASHO in addition to the AWS reached substantial agreement on the main features of advance at a meeting held July 18-19. Changes relate to design, materials, weld form, stresses and procedure. Major revisions are summarized below by La Motte Grover, chairman of the subcommittee on design, for the information of all interested in bridge welding.

Rules for welding procedure and form of weld grooves, previously given as recommendations, have been made specific and mandatory, in view of the fact that they have become common practice in good shops; when these rules are followed the contractor need not qualify his welding procedure. To leave room for progress, however, certain features may be varied, subject to proof by prescribed tests.

Butt-weld tension splices

In design, butt-welded tension splices have been approved for rolled beams, etc., in view of ample proof that they are superior to coverplated splices against repeated stress and impact. In making such butt-welds, shrinkage stresses must be controlled by proper sequence and procedure.

As to material, limitation of thickness and use of preheating or other precautions against too rapid cooling were assigned to a subcommittee for study and draft. It was recognized that increased welding difficulties are encountered with thick material in rigid assemblies, especially at low temperatures. With due attention to providing against these difficulties, and with use of the grade of steel required to insure weldability (carbon 0.25 per cent max., manganese 1.00 max.), such failures as occurred in certain welded bridges in Europe are believed to be precluded, since these failures were due to the grades of steel used and other factors not comparable to American conditions.

A minimum size of fillet welds is specified for various thicknesses, in consideration of rate of cooling. The form of fillets is also correlated with service; miter-shaped welds with small convexity are acceptable for all cases of static stress and for shear parallel to the weld axis, while fatigue loading transverse to the weld calls for the more expensive convex profile.

Working stress provisions have been modified for highway bridges to eliminate reduction for reversed and pulsating stress, except for members whose maximum stress is caused by a critical loaded length of two panels or 60 ft. This change resulted from analysis of service conditions of highway bridges and from experience, and takes account of the fact that highway bridges do not receive as many applications of loads approaching the design loading as railway bridges.

Butt welds ground or planed flush, and thereby improved in fatigue resistance, may be proportioned at static-load stress values even though they carry reversed or pulsating stress.

Plug and slot weld

An important addition to the revised specifications is a clause which approves arc-welded plug and slot welds of the type that is filled with weld metal; this approval was based on a series of static tests. Fatigue tests of such welds are in progress, but at the present conservative stress allowances they are not regarded as essential to justify the use of plug and slot welds at the values used for fillet welds.

For electrodes, the AWS-ASTM specification for electrodes, A-233-40T, just published, and the corresponding revised specification for gas welding rods, have been adopted. Supplementary tests are specified, however, to demonstrate the suitability of the rods for welds made in specific positions. Optional provisions allow prior tests to be accepted on certificate, as a means of encouraging reciprocity between states and cities.

Among other revisions are more specific requirements as to tolerances of fit-up and preparation of edges for butt welds, size of electrodes and inspection and safety requirements. Gas gouging is specifically approved for removing defects.

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North Carolina waterworks board named

Appointment of five members to the North Carolina State Board for Examination and Registration of Waterworks Operators was announced July 25 by P. W. Frisk, of Enka, N. C., and chairman of a special committee of the North Carolina Section of the American Water Works Association named to draw up plans for the new board. Members named are: W. M. Franklin, of the Dilworth water plant at Charlotte; R. S. Phillips, of the Durham municipal water department; W. D. Ryan, of the Tarboro water department; A. O. True, of Proximity Mills, Greensboro; and D. S. Asbell, assistant sanitary engineer of the North Carolina state board of health.

The new examining board is sponsored by the North Carolina section of the American Water Works Association, the state board of health and the waterworks school of North Carolina State College. It was approved at a recent meeting of the waterworks officials at North Carolina State College; and will issue three grades of certificates—A, B and C. The registration plan is to be operated on a voluntary basis and is designed to raise the standards of waterworks operators in the state.

T. E. Twitty, superintendent of the water department at Thomasville, and W. M. Franklin, of the Dilworth plant at Charlotte, are members of the special committee of which Frisk was chairman.

A popular design

Chicago Bridge & Iron Co., Chicago, has built or under construction ten water tanks similar to the structure above, which was recently completed for the town of Waynedale, Ind. This structure is 80 ft. in height and 50,000 gal. in capacity.

Among the first tanks of this unusual design constructed by the Chicago company was a tank for the town of Longmont, Colo. Since then there has been wide interest in this type of construction.

MEN AND JOBS

JAMES S. ALLEN, chief engineer of the board of Mississippi Levee Commissioners and stationed at Greenville, Miss., was recently reelected to continue his old duties.

CHARLES T. WILSON, formerly city engineer of Waterloo, Iowa, has been named superintendent of Waterloo's new sewage disposal plant. NATHAN B. BARBER, former assistant engineer, is now city engineer.

W. H. MILLS, JR., testing engineer with the South Carolina State Highway Department, has been named chairman of a special committee of the Highway Research Board, National Research Council, to study soil-cement roads. Other members are: HAROLD ALLEN, division of test and research, Public Roads Administration; M. D. CATTON, Portland Cement Association; V. L. GLOVER, engineer of materials, Illinois Division of Highways; L. D. HICKS, assistant engineer of materials, North Carolina State Highway Commission; W. S. HOUSEL, research consultant, Michigan State Highway Department; R. R. LITEHISER, testing engineer for the Ohio Department of Highways; F. V. REAGEL, engineer of materials and tests, Missouri State Highway Commission; CARL R. REID, testing engineer, Oklahoma State Highway Commission; and T. E. STANTON, materials and research engineer with the California Division of Highways.

A. O. JOHNSON, assistant city engineer at Grand Forks, N. D., for the past three years, is now associated with the Westinghouse Co. at Pittsburgh in the works management department.

ABEL WOLMAN, professor of sanitary engineering at Johns Hopkins University, GUSTAV J. REQUARDT, practicing engineer and consultant to the Public Improvement Commission at Baltimore, and NATHAN L. SMITH, former chief engineer of the Maryland State Roads Commission, have been named consulters to the Baltimore City Plan Commission. George Cobb, chief engineer of Baltimore, is ex-officio member of the plan board.

WILLIAM C. CHAPIN, since 1929 associated with Robert Moses on the development of parkways for New York City, has begun new duties as chief engineer of the Pittsburgh Regional Planning Association. Chapin is the first chief engineer of this body, which is a private organization offering consulting services to public agencies. Chapin is a graduate of Northeastern University.

MELVIN P. HATCHER, associate engineer with Burns & McDonnell Engineering Co., Kansas City, Mo., has succeeded T. D. SAMUEL, JR., as chief engineer of the Kansas City, Mo., water department. Hatcher soon after graduation from the University of Missouri in 1920 joined the Burns & McDonnell firm to remain with them until the present time, excepting one year of post graduate work at Ohio State University in 1926-27. Samuel has not announced his plans.

ERNEST E. SCHENK, Waterloo, Iowa, is making a preliminary survey for a new sewage disposal plant at Traer, Iowa.

H. M. ARMSTRONG, of Frederickton, N. B. and a member of the engineering staff of the New Brunswick Public Works Department, has begun new duties as chairman of a new inter-departmental committee to coordinate Canadian war activities in the province of New Brunswick. Also named a member of the committee is G. A. VANDERVOORT of St. John, acting chief engineer of the New Brunswick Electric Power Commission.

ALFRED H. FLETCHER, sanitary engineer, department of health, Memphis, Tenn., has been appointed associate in sanitary engineering in the school of hygiene and public health at Johns Hopkins University. Fletcher, a graduate of the Massachusetts Institute of Technology with the class of 1921, received a master's degree in engineering from Harvard University in 1932. Following one year with the International Health Board as sanitary engineer, he was assigned to U. S. Public Health Service for Malaria Control Work with headquarters in Memphis. Fletcher spent 1½ years with the engineering department of the city of Memphis. This was followed by one year with the New Hampshire State Health Department and four years with the Louisiana State Health Department. Starting in 1929, he spent the next 11 years with the city of Memphis as sanitary engineer and director of the bureau of sanitation. In his new job Fletcher will serve under the direction of Abel Wolman, professor of sanitary engineering.

B. C. LILLIS, a civil engineer of Billings, Mont., has been appointed water master for the distribution of irrigation water from the Little Big Horn River and Lodge Grass Creek on the Crow Indian reservation in Montana.

FRED W. OELHAFEN, for 40 years an employee of the city water department of Milwaukee, has retired and moved with his family to Spring Lake, Wis.

JOHN E. QUINN, former city engineer of Rensselaer, N. Y., in company with H. F. STONE and J. C. MACY, both of Albany, have organized the Novagraphic Co. with headquarters in Albany. The new firm is offering consulting services for all branches of construction, particular attention to be devoted to advance studies for railroad, bridge, highway and airport work.

E. N. WILSON, engineer for the Magnolia Petroleum Co. at Oklahoma City, has been transferred to the company's home office at Dallas, Texas.

A. C. CALVERT, superintendent and engineer for the Barnsdall Oil Co., has been promoted to division superintendent at Galena, Kan., for the Barnsdall firm.

CHARLES M. CLARK, chief engineer of the Board of Water Supply, New York City, was presented with an honorary doctor of engineering degree from the Clarkson College of Technology at Potsdam, N. Y., June 2. Clark, who entered the service of the City of New York in 1893 as an axeman, this year, upon the death of Walter Spears was made chief engineer of the board. He was in charge of the building of Cross River Dam; the Catskill aqueduct from Peekskill to the City limits of New York; the 18-mi. Shandaken tunnel, and City Tunnel No. 2. In 1936 he was made deputy chief engineer.

FRANK M. MASTERS, associated with the firm of Modjeski and Masters, of Harrisburg and New York, since 1904, will continue the consulting work of the firm, which was begun by the late Ralph Modjeski in 1893, under the firm's present name.

G. G. WENDT of Omaha, has begun new duties as superintendent of the Water and Light Department of the city of Falls City, Nebr. He succeeds the late Bert Querry. Wendt, for the past 15 years, has been a representative for the Fairbanks-Morse Co.

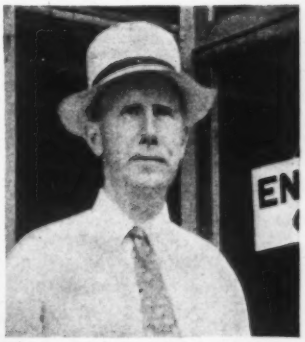
ROBERT L. MORRIS, Bristol, Tenn., is director of the newly-created WPA District No. 4 in Tennessee. The district includes 24 upper east Tennessee counties.

MORTON E. FRYE of Palmyra, Pa., has been appointed grade crossing engineer with the Pennsylvania Department of Highways. Other appointments include: SIMON M. LUTZ, JR., of Lutzville, as engineer, and ELLWOOD E. BULLER, of Altoona, engineer.

Operations on the left abutment at Shasta Dam gets the approval of W. E. BLOMGREN (left), senior engineer at Denver with the Bureau of Reclamation, and RALPH LOWRY (right), construction engineer, Shasta Division.

MEN AT WORK

Running smoothly under the direction of Superintendent FREDERICK L. RAY (above) is the new one-half million dollar sewage disposal plant at Anderson, Ind. Ray worked in Brooklyn, N. Y., Louisville, Ky. and Indianapolis, Ind. before going to Anderson.



As resident engineer on the Rainbow Bridge job at Niagara Falls for Edward P. Lupfer Engineering Co., engineers supervising construction, R. W. CADY is plenty busy these days. Placement of concrete for the abutments of his $4,500,000 job has begun.

Three eminent scientists take a walk at the A. S. T. M. meeting in Atlantic City. Many are the specifications for engineering materials that have benefited from the work and wisdom of L. B. TUCKERMAN (left in group at left), chief of the Bureau of Standards' division of mechanics and sound; H. F. MOORE (center), professor of engineering materials, University of Illinois; and CLOYD M. CHAPMAN, consulting engineer, New York.

Enticed outside to look over the sedimentation tank, JERRY J. DEMLING (above) assistant chemist at the 50-mgd Grand Rapids water filter plant, was caught with chlorine containers as a background.

J. P. TROTTER (left at right), chief bridge engineer for the Alabama State Highway Department, and CHRIS J. SHERLOCK, Alabama state highway director, were inspecting the $1,650,000 toll span across the Tennessee River below Wilson Dam when this photo was taken. They are standing on the walkway at the center of the bridge.

OBITUARY

GEORGE R. GRIFFITH, president of Linde & Griffith Co., contractors of Newark, N. J., and director of the Linde-Griffith Construction Co., Newark, died at his home in Verona, N. J., Aug. 4.

J. E. HOLLINGSWORTH, 69, Memphis contractor who about forty years ago organized J. E. Hollingsworth & Co. and until recently was city building commissioner of Memphis, died in that city July 28.

RUSSELL HARRY PALMER, president of the National Machinery Co., Ltd., Vancouver, B. C., and pioneer engineer and contractor of the Pacific Northwest, died July 30 at Vancouver.

CLAIBORNE M. JAMES, 68, construction engineer, who served with the Baltimore & Ohio R.R. as construction engineer and as engineer of construction for the Atlantic Coast Line R.R., died July 31 in Cumberland, Md. He was president of the Tri-State Engineering Co.

MILO SMITH LONG, 54, engineer of the Nashville, Tenn. office of the U. S. Engineers, died in Murfreesboro, Tenn. last week.

GEORGE C. WARREN, 76, director of Warren Bros. Co., Cambridge, Mass., which he and his six brothers organized in 1898, died in Greenbush, Mass., July 31.

WALTER T. BAKER, SR., 53, president of the Hydro Construction Co., Buffalo, N. Y., died in Westfield, N. Y., Aug. 2.

GISPER FRASIER, employed for a number of years as resident engineer for the North Carolina State Highway & Public Works Commission and stationed at Wallace, died July 27.

ROBERT P. SHARPHAM, 92, who worked on engineering surveys and construction of the Nova Scotia Ry., Midland Ry. and the Halifax & Southwestern Ry., all in Nova Scotia, died recently in Windsor, N. S.

TIMOTHY LAWLER, an organizer of the Pacific Constructors, Inc., contractors for the $36,000,000 Shasta Dam project, died July 26 in Los Angeles.

WILLIAM SEWARD, 72, retired civil engineer of New York City and graduate of New York University, died at Vale Perkins, Quebec.

JOHN C. OVERMYER, 69, former engineer for the Ohio State Highway Department, died July 21 while visiting near Lansing, Mich.

CHARLES F. DREW, secretary-treasurer of the Rust Engineering Co., died in Dormont, Pa., Aug. 5. Drew was formerly associated with Thompson-Starrett Co. and later with the Koppers Co.

CHARLES E. WELLS, 82, consulting engineer of North Adams, Mass., died in that city August 4. Wells, a graduate of Worcester Polytechnic Institute, was in charge of construction of the Pathfinder Dam in Wyoming for the Bureau of Reclamation.

GEORGE E. MCCLINTOCK, 62, recently bridge inspector for the Ohio State Highway Department and for 40 years active in the construction industry, died July 21 in Cleveland. He had served as construction superintendent with the Bass Construction Co. and for John Gill & Sons.

WILLIAM A. SMITH, 50, WPA administrator for the state of Virginia, died July 23 in Richmond. Smith obtained his engineering education at the University of Virginia and was at one time assistant city engineer at Petersburg, Va., and later city manager of Dunedin, Fla.

FREDERICK C. WYSE, 56, former city engineer at Columbia, died July 18 in Spartanburg, S. C. Wyse, a graduate of Clemson College, in 1908 he joined the engineering department of the city of Columbia as paving engineer, being made superintendent of the sewage and water department three years later and soon afterward city engineer.

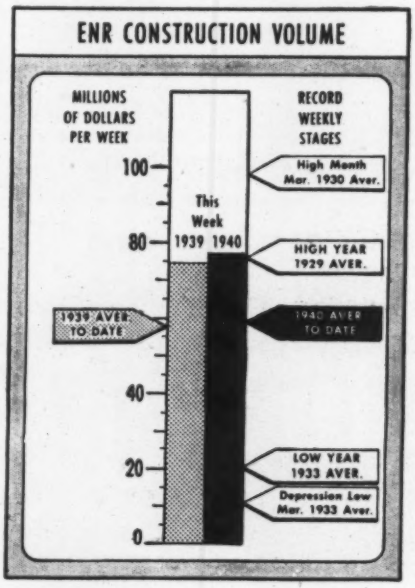
FREDERICK W. BADGER, principal assistant engineer of the Cleveland Union Terminals Co., died July 23 in Cleveland, Ohio.

CONTRACTS AND CAPITAL

FEDERAL SPENDING for increased power output and military housing is largely responsible for the fifth successive week of construction gains over 1939. The week's total, $76,453,000, tops a year ago by 3 per cent, but is 15 per cent below the volume last week.

Private awards are 26 per cent lower than a year ago and 19 per cent below a week ago. Public construction exceeds last year by 10 per cent, but is 14 per cent under last week's figure. Federal work continues at a high rate, gaining 120 per cent over last year and 38 per cent over a week ago.

Gains over a year ago are recorded in waterworks, industrial, public and commercial buildings, and earthwork and drainage. Industrial and public buildings, and earthwork top last week's totals.



New capital for construction purposes for the week totals $167,830,000, an increase of 780 per cent over a year ago. The week's new financing total brings 1940 volume to $1,888,893,000, 4 per cent higher than for the 32-week period last year.

CONTRACTS

(Thousands of dollars)

	Week Ending Aug. 10 1939	Aug. 1 1940	Aug. 8 1940
Federal	$18,474	$29,436	$40,558
State & Municipal	40,235	45,778	24,213
Total public	$58,709	$75,214	$64,771
Total private	15,725	14,388	11,682
TOTALS	$74,434	$89,602	$76,453
Cumulative			
1940	(32 weeks)		$1,903,523
1939	(32 weeks)		$1,866,605

Note: Minimum size projects included are: Waterworks and waterways projects, $15,000; other public works, $25,000; industrial building, $40,000; other buildings, $150,000.

NEW PRODUCTIVE CAPITAL

	Cumulative 1939 32 Wks.	1940 32 Wks.
NON-FEDERAL	$978,708	$1,080,321
Corp. Securities	141,726	124,501
State & Mun.	392,830	551,143
R.E.A. loans	89,445	.....
U.S.H.A. loans	160,852	104,728
R.F.C. loans	3,855	113,949
Fed. Air-Hwy	190,000	184,000
FEDERAL	$832,028	$808,572
TOTAL CAPITAL	$1,810,736	$1,888,893

FHA MORTGAGES

	Week Ending Aug. 5 1939	July 27 1940	Aug. 3 1940
Selected for appraisal	$19,149	$27,051	$25,110*
Cumulative			
1940	(31 weeks)		$764,461*
1939	(31 weeks)		$700,015

* Subject to revision.

ENR INDEX NUMBERS

Index Base = 100		1913	1926
Construction Cost	Aug. '40	242.18	116.42
Building Cost	Aug. '40	201.71	109.94
Volume	July, '40	308	135

Housing bodies must conform to state laws

Local housing authorities must conform to "the spirit as well as the letter" of state registration laws for architects and engineers, the U. S. Housing Authority recently instructed its regional directors. The question arose in the case of an authority which had sought to utilize an unlicensed architect on the grounds that the individual buildings in the project fell within the exemption clause of the state law. "It does not seem tenable," Assistant Administrator Jacob Crane pointed out, "that a person unable or unwilling to comply with the licensing laws of his state * * * is capable of successfully handling the intricate problem of a low-cost slum-clearance project."

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Tacoma Narrows Bridge tolls reduces

On August 1 commuter rates on the new Tacoma Narrows Bridge near Tacoma, Wash., were reduced from 40 to 30 cents for cars and from 15 to 10 cents for passengers. The bridge toll for casual users will remain the same or 55 cents for car and driver and 15 cents for each additional passenger. The rate cut followed "greater patronage of the bridge by regular users than was expected," according to L. V. Murrow, state highway director and chief engineer for the Washington Toll Bridge Authority.

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Van Vleck to rate New York buildings

Albion N. Van Vleck, formerly first deputy commissioner of housing and buildings of the city of New York, has been hired by the Mortgage Conference of New York as consulting engineer for the inspection and structural rating of buildings under construction in the New York area. The rating work, started about two years ago, is not concerned with buildings under a six-story elevator apartment building. It will cover the structural factors in mortgage loan analysis for members of the Mortgage Conference, which includes savings banks, lending banks, mortgage companies and life insurance companies. About 60 to 80 apartment houses are rated yearly, with the one of nine grades designated depending on how the structure being rated compares with the average of its type.

Austin Co. Photo

Boeing's $2,000,000 Seattle addition nears completion

First units of the $2,000,000 addition being constructed for the Boeing Aircraft Co. at Seattle will be ready for occupancy this month. This will enable the company to start work on the $23,000,000 order for twin-engine attack bombers for which the plant is being erected. The addition, totaling more than 600,000 sq.ft., will increase the plant area by 75 per cent.

The large assembly plant is seen in the left foreground and already under roof to the right of the assembly plant is the raw material and parts storage warehouse. Drop hammers, presses and other heavy machinery required to form plane parts will be installed in the building which is seen rising in the background nearest the waterway. This section, 200 ft. by 450 ft., will be flanked by a two-story section, 250 ft. by 450 ft., for miscellaneous metal-working and sub-assemblies. Also provided will be an unobstructed area 250 ft. by 450 ft. with 35 ft. overhead clearance to permit freedom in movement of parts and sub-assemblies for final assembly. An elaborate system of underground corridors will provide intercommunication between various portions of the plant.

The Austin Co., engineers and builders of Cleveland, are doing the work.

MEETINGS

AMERICAN ASSOCIATION of State Highway Officials, annual convention, Seattle, Wash., Sept. 15-19.

ASSOCIATED GENERAL CONTRACTORS, fall meeting, Santa Fe, N. M., Sept. 30-Oct. 3.

FEDERATION OF SEWAGE WORKS ASSOCIATIONS, first national convention, Chicago, Oct. 3-5.

NATIONAL SAFETY COUNCIL, national safety congress and exposition, Chicago, Oct. 7-11.

AMERICAN PUBLIC HEALTH ASSOCIATION, annual meeting, Detroit, Mich., Oct. 8-11.

AMERICAN WELDING SOCIETY, annual meeting, Cleveland, Ohio, Oct. 20-25.

REGIONAL AND LOCAL

THE MOLES, annual summer outing at Karatsonyi's, Glenwood Landing, L. I., N. Y., Aug. 21.

NEW YORK STATE and County Highway Superintendents Association, Utica, New York, Aug. 22-23.

NEW ENGLAND WATER WORKS ASSOCIATION, annual convention, New York City, Sept. 24-27.

AMERICAN WATER WORKS ASSOCIATION, Virginia Section, Charlottesville, Va., Sept. 5-6; Western Pennsylvania Section, New Castle, Pa., Sept. 17-19; Wisconsin Section, Manitowoc, Wis., Oct. 14-16; New Jersey Section, Atlantic City, N. J., Oct. 18-19; California Section, Los Angeles, California, Oct. 23-26; Four State Section, Wilmington, Del., Nov. 7-8. Missouri Valley Section, Omaha, Neb., Nov. 13-15.

SHORT COURSES

SHORT SCHOOL for water and sewerage operators, University of Maryland, Sept. 3-5. Sponsored by Maryland-Delaware Water and Sewerage Association.

ENGINEERING CONFERENCES

SECOND ANNUAL Arizona Land Surveyors Conference, Tucson, Ariz., Oct. 5.

CONTRACT UNIT PRICES

What contractors are bidding on different kinds of construction work

STREET SURFACING, WALKS
MILWAUKEE, WIS.

OWNER: City of Milwaukee, Wis. J. P. Schwada, city engineer.

PROJECT: Construction of concrete sidewalk on N. 39th St.; 8-in. reinforced concrete pavement on W. Villard Ave.; and 3-in. standard sheet asphalt wearing surface on S. 6th St. Concrete sidewalks to be 4-in. thick. Driveways of 8-in. concrete.

CONDITIONS: All portions of work to be completed within 2 months. Highway transportation facilities available. Contractor to furnish all materials. Wages range from 97½c. to $1.65 for skilled labor, and from 60 to 85c. for unskilled.

BIDS: Bids were opened May 3, 1940. List of bidders and range of prices are shown below.

1. Concrete Sidewalk on 39th St.

LIST OF BIDDERS: Time for completion, 2 months.

1. J. C. Bluhm & Sons, Milwaukee, Wis. (contract) $1,670
2. N. Harris, Milwaukee, Wis. 1,679
3. Bodemann Constr. Co., Milwaukee, Wis. 1,886
4. Gumz & Switalski, Inc., Milwaukee, Wis. 2,071
5. Modern Road Builders, Milwaukee, Wis. 2,096
6. J. G. Jansen Constr. Co., Milwaukee, Wis. 2,401

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Grading	197 c.y.	$0.40	$0.40	$0.45
2. Sidewalk, 4-in	9,256 s.f.	.165	.16	.18
3. Curb and gutter	30 l.f.	.90	1.00	1.25
4. Driveways	100 s.f.	.25	.23	.30
5. Alley paving	32 s.y.	1.60	1.78	1.65
6. Remove curb and gutter	30 l.f.	.22	.30	.35

2. Reinforced Concrete Pavement, Villard Ave.

LIST OF BIDDERS: Time for completion, 2 months.

1. Bodeman Constr. Co., Milwaukee, Wis. (contract) $15,951
2. N. Harris, Milwaukee, Wis. 16,184
3. J. C. Bluhm & Sons, Milwaukee, Wis. 16,884
4. R. L. Reisinger & Co., Milwaukee, Wis. 17,508
5. Gumz & Switalski, Inc., Milwaukee 17,613
6. Modern Road Builders, Milwaukee, Wis. 17,726

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Grading	835 c.y.	$0.30	$0.35	$0.50
2. 8-in. rein. conc. pavement	6,358 s.y.	1.725	1.75	1.78
3. Curb and gutter	2,699 l.f.	.78	.78	.85
4. Sidewalk	16,571 s.f.	.15	.15	.16
5. Concrete base	10 s.y.	1.50	1.65	1.80
6. Concrete paving	87 s.y.	1.60	1.65	1.85
7. Remove curb and gutter	54 l.f.	.20	.20	.22
8. Remove sidewalks	181 s.f.	.05	.02	.07

3. Sheet Asphalt Surface, South 6th St.

LIST OF BIDDERS: Time for completion, 2 months.

1. B. A. Froemming, Milwaukee, Wis. (contract) $22,973
2. Milwaukee Constr. Co., Milwaukee, Wis. 23,805
3. White Consolidated, Inc., Milwaukee, Wis. 24,410

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Grading	269 c.y.	$0.65	$0.70	$0.68
2. Asphalt surfacing	3,443 c.y.	1.58	1.64	1.59
3. Concrete base	3,261 s.y.	1.79	1.89	1.94
4. Binder	8 ton	8.65	9.00	8.30
5. Curb and gutter	2,264 l.f.	.89	1.00	1.00
6. Sidewalk	17,770 s.f.	.19	.21	.195
7. Driveway	2,177 s.f.	.30	.33	.32
8. Curb and walk	4,271 s.f.	.28	.27	.32
9. Gutter	55 l.f.	.70	.60	.90
10. Alley	20 s.y.	1.65	1.60	1.55
11. Pavement removal	3,610 s.y.	.65	.60	.72
12. Surface removal	178 s.y.	.25	.28	.32
13. Curb and gutter removal	2,499 l.f.	.08	.06	.07
14. Walk removal	23,074 s.f.	.065	.06	.07
15. Removal of steps	117 l.f.	.12	.15	.10
16. Walk removal	588 s.f.	.06	.06	.05

BASCULE BRIDGE
OCEAN CITY, MD.

OWNER: State Roads Commission of Maryland, Baltimore.

PROJECT: Construction of bascule type bridge over Sinepuxent Bay at Ocean City, Md. Bridge to be 2,300 ft. long, of continuous concrete slab on concrete pile bents, double leaf steel bascule. There is to be a 70-ft. clear channel at bascule span, and a 26-ft. clear channel at west end. Roadway to be 46 ft. wide; sidewalk width 2 ft.

CONDITIONS: Contractor to furnish all materials and complete work in 275 days. Rail, highway and water transportation facilities available. Wage rates are: skilled, 56c. per hr.; semi-skilled, 45c.; and common, 35c. per hr.

BIDS: Twelve bids were opened April 30, 1940, ranging from the contract low of $846,011 to $1,182,984.

LIST OF BIDDERS:

1. Tidewater Constr. Co., Norfolk, Va. (contract) $846,011
2. Eastern Engr. Co., Atlantic City, N. J. 883,459
3. McLean Cont. Co., Baltimore, Md. 885,193
4. Raymond Concrete Pile Co., New York, N. Y. 908,628
5. Potts & Callahan Contr. Co., Inc., Baltimore, Md. 925,951
6. T. A. Loving & Co., Goldsboro, N. C. 926,856
7. Diamond Constr. Co., Washington, D. C. 937,745
8. Tuller Constr. Co., Red Bank, N. J. 1,007,915
9. Merritt-Chapman & Scott Corp., New York, N. Y. 1,074,566
10. Chas. H. Tompkins Co., Washington, D. C. 1,074,852
11. Brann & Steuart Co., Philadelphia, Pa. 1,180,068
12. Kaufman Constr. Co., Philadelphia, Pa. 1,183,984

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Cl. A conc. in abut., ret. walls, slab span, w. chan. span	9,970 c.y.	$20.00	$18.00	$23.00
2. Cl. A conc. in basc. piers, oper. house	2,064 c.y.	25.00	17.00	21.00
3. Cl. X conc., fndn. seal	421 c.y.	25.00	15.00	20.00
4. 24-in. sq. precast conc. piles in pile bents	40,300 l.f.	4.00	5.70	4.50
5. 18-in. sq. precast conc. piles in abut and basc. piers	17,300 l.f.	2.75	3.75	3.30
6. Prec. rein. conc. sh. piling, w. abut	L.S.	5,500.00	7,162.50	10,000.00
7. Bit. protect. coat	L.S.	1,200.00	1,072.00	1,000.00
8. Protect. coat. conc. work	9,800 s.y.	.50	.20	.60
9. Reinf. steel bars	2,346,000 lb.	.04	.038	.045
10. Wet excavation	2,220 c.y.	10.00	7.00	5.00
11. Class 2 excavation	1,270 c.y.	1.00	5.00	1.00
12. Stone backfill	295 c.y.	7.00	8.35	8.00
13. Str. steel, basc. span, basc. piers	623,000 lb.	.08	.08	.075
14. Str. steel, w. channel span	82,000 lb.	.04	.041	.05
15. Open grid steel rdwy. deck	5,520 s.f.	2.00	2.10	2.00
16. Cast steel track gird. plates; roll. st. seg. gird. plates	29,400 lb.	.16	.20	.20
17. 3-in. pipe handrail	5,270 l.f.	1.00	.80	1.00
18. Malleable iron castings	11,500 lb.	.30	.15	.20
19. Galv. curb armor and rdwy. expan. joints	119,400 lb.	.12	.1135	.10
20. Machinery equipment	28,000 lb.	.30	.35	.30
21. Speed reducers	L.S.	1,600.00	2,000.00	2,000.00
22. Electrical equipment	L.S.	17,500.00	17,200.00	16,500.00
23. Overhead type barrier gates	L.S.	17,000.00	18,200.00	18,000.00
24. Safety gates	L.S.	1,700.00	1,800.00	1,800.00
25. Class A concrete	154 c.y.	30.00	28.30	30.00
26. Operator's house	L.S.	4,000.00	5,200.00	2,000.00
27. Water supply line	600 l.f.	1.50	.75	1.00
28. Tr. Cl. A timber piles	27,550 l.f.	.80	.90	.80
29. Treated timber	100 Mbm	150.00	169.50	130.00
30. Backfill	59,300 c.y.	.425	.50	.35
31. Tamped fill	1,265 c.y.	.60	1.00	.60
32. Dredging	46,500 c.y.	.50	.25	.45
33. Precast conc. test piles, 18-in. sq.	140 l.f.	2.50	3.00	3.00
34. Same, 24-in. sq.	900 l.f.	5.00	4.20	4.00
35. Drive 18-in. prec. conc. test piles.	130 l.f.	1.50	3.00	2.00
36. Drive 24-ir. prec. conc. test piles.	840 l.f.	2.00	3.25	2.00
37. Timber test piles	485 l.f.	1.50	1.00	1.00
38. 125-ton loading tests	12 ea.	600.00	525.00	600.00
39. 70-ton loading tests	2 ea.	400.00	475.00	600.00
40. Omission of overhead type barrier gates and substitution of concealed type barrier gates	L.S.	−600.00	−400.00	−900.00